



SLOVENSKI STANDARD
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Refuse collection vehicles and their associated lifting devices - General requirements
and safety requirements - Part 1: Rear-end loaded refuse collection vehicles

Abfallsammelfahrzeuge und die dazugehörigen Schüttungen - Allgemeine
Anforderungen und Sicherheitsanforderungen - Teil 1: Hecklader

Bennes de collecte des déchets et leurs lève-conteneurs associés - Exigences générales
et exigences de sécurité - Partie 1: Bennes à chargement arrière

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1501-1:1998+A2

November 2009

ICS 43.160

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English Version

**Refuse collection vehicles and their associated lifting devices -
General requirements and safety requirements - Part 1: Rear-
end loaded refuse collection vehicles**

Bennes de collecte des déchets et leurs lève-conteneurs
associés - Exigences générales et exigences de sécurité -
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Abfallsammelfahrzeuge und die dazugehörigen
Schüttungen - Allgemeine Anforderungen und
Sicherheitsanforderungen - Teil 1: Hecklader

This European Standard was approved by CEN on 13 February 1998 and includes Amendment 1 approved by CEN on 2 February 2004 and Amendment 2 approved by CEN on 10 October 2009.

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Foreword

This document (EN 1501-1:1998+A2:2009) has been prepared by Technical Committee CEN/TC 183 "Waste management", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2010, and conflicting national standards shall be withdrawn at the latest by May 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1, approved by CEN on 2004-02-02 and Amendment 2, approved by CEN on 2009-10-10.

This document supersedes EN 1501-1:1998.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1** and **A2** **A2**.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

A2 For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document. **A2**

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This European Standard is the first one of a series of coordinated standards dealing with specification, design, safety and testing of refuse collection vehicles (RCV) and associated lifting devices.

Besides Part 1: Refuse collection vehicle and their associated lifting devices; Rear-end loaded RCV; the following parts of EN 1501 are in preparation:

- "Refuse collection vehicle and their associated lifting devices; Side loaded RCV"
- "Refuse collection vehicle and their associated lifting devices; Front loaded RCV"

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

EN 1501-1:1998+A2:2009 (E)**Introduction**

This series of European Standard EN 1501 should be read in conjunction with the standards developed by CEN/TC 183/WG 1 for mobile waste containers (series of standards of EN 840) and stationary waste containers (series of standards of prEN 12574) that are compatible with the lifting devices specified in these standards.

The standard is designed for careful consideration by designers, manufacturers and suppliers of refuse collection vehicles (RCV).

1 Scope

This Part of the European Standard specifies the safety and design requirements for the bodywork of (rear loaded) refuse collection vehicles (RCV) for the collection, transportation and discharge of solid waste materials and recyclable materials operated by hydraulic power.

Associated lifting devices and references to chassis interfaces are also covered in this document.

Further definitions, covering types and use of refuse collection vehicles (RCV) and lifting devices are given in clause 3 and 4.

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2 Normative references

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This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1, *Safety of Machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology*

EN 292-2, *Safety of Machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications*

EN 294:1992, *Safety of machinery – Safety distances to prevent danger zones being reached by the upper limbs*

EN 349, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body*

EN 414:1992, *Safety of machinery – Rules for the drafting and presentation of safety standards*

EN 418, *Safety of machinery – Emergency stop equipment, functional aspects – Principles for design*

prEN 574, *Safety of machinery – Two-hand control device*

EN 840-1, *Mobile waste containers – Part 1: Containers with 2 wheels, with a capacity from 80 l to 390 l for comb lifting devices, dimensions and design*

EN 840-2, *Mobile waste containers – Part 2: Containers with 4 wheels with a capacity from 500 l to 1200 l with flat lid(s), for trunnion and/or comb lifting devices, dimensions and design*

EN 840-3, *Mobile waste containers – Part 3: Containers with 4 wheels, with a capacity from 770 l to 1300 l with dome lid(s), for trunnion and/or comb lifting devices, dimensions and design*

EN 840-4, *Mobile waste containers – Part 4: Containers with 4 wheels, with a capacity from 750 l to 1700 l with flat lid(s), for wide trunnion or BG and/or wide comb lifting device, dimensions and design*

EN 840-5, *Mobile waste containers – Part 5: Performance requirements and test methods*

EN 840-6 *Mobile waste containers – Part 6: Safety and health requirements*

prEN 954-1, *Safety of Machinery – Safety-related parts of control systems - Part 1: General principles for design*

EN 982, *Safety of machinery – Safety requirements for fluid power systems and components - Hydraulics*

EN 1501-4:2007, *Refuse collection vehicles and their associated lifting devices – General requirements and safety requirements — Part 4: Noise test code for refuse collection vehicles*

prEN 12574-1, *Stationary waste containers – Part 1: Containers with a capacity from 1700 l to 5000 l with flat or dome lid(s), with trunnion, double trunnion or pocket lifting devices*

prEN 12574-2, *Stationary waste containers – Part 2: Test methods for stationary waste containers with a capacity up to 5000 l*

prEN 12574-3, *Stationary waste containers – Part 3: Safety and health requirements for stationary waste containers with a capacity up to 5000 l*

EN 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 417:1992, *Graphic symbols for use and equipment – Index, survey and compilation of single sheets*

ISO 447, *Machine tools – Direction of operation of controls*

ISO/DIS 612, *Road vehicles - Dimensions of motor vehicles and towed vehicles - Terms and definitions*

ISO 2768-1, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO 7000:1989, *Graphic symbols for use on equipment – Index and synopsis*

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1

refuse collection vehicle (RCV)

A vehicle normally used for the collection and transportation of domestic and bulky waste or recyclable materials based on loading via waste containers or by hand. The vehicle may be equipped with a compaction mechanism.

An RCV comprises a chassis with cab onto which the bodywork is mounted. The bodywork consist of two main parts namely the body and the tailgate. It may be equipped with a container loading device.

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3.2
cab
enclosure mounted on the chassis in front of the body where the driver controls the road vehicle and the rest of the crew can sit

3.3
body
That part of the bodywork in which the collected and compacted waste is stored. It may rotate as part of the compacting action (see 3.10).

3.4
tailgate
The rear section of the bodywork which is hinged to the body. The tailgate can be opened to discharge the waste from the body.

The tailgate incorporates both the hopper and the compaction mechanism.

3.5
hopper
the lower part of the tailgate into which the waste is loaded via containers or by hand

3.6
rave rail
the loading edge of the hopper and produced as a cross beam (see figure A.1) or the edge of a guide flap (see figure A.5).

3.7
guide flap
a removable or foldable extension to the rave rail

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3.8 Capacity

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3.8.1
capacity of bodywork

The effective volume that can be filled with compacted waste. In case of blade compaction mechanisms, this capacity is defined as the one included between the eventual ejection plate in its retracted position and the compaction mechanism, the latter being positioned at the end of its compaction cycle.

The capacity of the bodywork is stated in m³ rounded off to one decimal.

3.8.2
capacity of rotation drum system

the volume of the cylindrical body

3.8.3
capacity of hopper

the effective volume of water the hopper theoretically can contain (see figure A.1).

The capacity of the hopper is stated in m³.

3.9
loading height

is measured from the upper edge of the rave rail (see figure A.1) to the level where the operator is standing, when the vehicle is empty and ready for loading

3.10**compaction mechanism**

a mechanism used to compact and transfer the waste from the hopper into the body either by means of a plate system which sweeps the hopper by a single or more movement or by a rotational screw movement of the body

3.11**compaction pressure**

the horizontal perpendicular force, caused by the compaction mechanism, divided by the surface of the internal vertical section of the body, in Newton per square millimetre

3.12**ejection plate**

a plate occupying the whole cross sectional area of the body, capable of travelling the full length of the body

3.13**discharge system**

a device to empty the refuse collection body

3.14**discharge time**

the actual time for the ejection of the load (measured in s) including opening and closing of the tailgate

3.15**designated waste container**

the range or types of receptacle for storing waste prior to the collection by a RCV compatible with the RCV's lifting device

3.16**lifting device**

a structure which picks-up, tilts and empties waste containers into the hopper

3.17**adaption frame**

a structure which can be used to mount the lifting device to the tailgate

3.18**handloading**

an operation covering the loading of waste into the rear of the vehicle directly by hand

3.19**shear trap**

arises when two surfaces (at least one surface movable) are passing close to each other edge to edge, which may trap part or parts of the operative's body or clothing

3.20**footboard**

a platform fixed to the rear of the RCV on which an operator can stand

3.21**satellite vehicle**

a small RCV, that can discharge its load directly into another RCV

3.22**control lever**

a hold to run control which has to be held in the ON-position all the time that motion is taking place

EN 1501-1:1998+A2:2009 (E)**3.23****working area**

the vicinity of the tailgate used for loading and servicing the RCV

4 Types**4.1 Rear loaded collection vehicles**

The RCV covered by this standard are rear-loaded. Waste is transferred manually or mechanically over the rave rail into a hopper. A compaction mechanism then transfers and compacts the waste from the hopper into the body of the vehicle. The tailgate i.e. the rear section of the body, is opened to discharge waste when the body is full. In rear loading vehicles, the tailgate consists of both the hopper and the compaction mechanism. There are several types of compaction systems, which are listed in 4.2.

4.2 Compaction system

Each RCV shall be fitted with one or more of the following compaction systems:

4.2.1 Automatic compaction system

All of the automatic compaction systems may be actuated either manually or by the emptying of a container into the hopper.

- Continuous cycle is one that continually cycles until stopped by an independent action ("AUTO");
- Single cycle is one that cycles once and then stops automatically ("SINGLE");
- Multi cycle is one that cycles for a given number of times and then stops automatically ("MULTI").

4.2.2 Semi-automatic compaction system

Controlled cycle is a single cycle controlled by the operator, by depressing one single button or lever, (hold to run control) from the start until any shear trap has been passed. Thereafter, the cycle will be completed automatically, even if the button or lever is released ("CTRL").

Intermittent cycle is a cycle where the compaction mechanism is automatically interrupted at least 500 mm before the rave rail. A hold to run control is then required to run the compaction mechanism for that part of the cycle where a shear trap is created ("SEMI") up to the end of the cycle.

4.2.3 Manual compaction system

Manual cycle is a cycle where compaction is controlled by the operator by means of a hold to run control ("MAN").

4.2.4 Selection of system

A selection of system is when a compaction operating system can be changed to or from any of the modes mentioned under 4.2.1 to 4.2.3 ("SELECT").

4.3 Discharge system

Each RCV shall be fitted with one of the following discharge systems:

4.3.1 Ejection plate system

This system allows the emptying of the body by moving the ejection plate to the rear, after opening the tailgate.

4.3.2 Rotation drum body

The discharge of rotation drums is done by reversing the rotation after opening the tailgate.

4.3.3 Discharge by tipping

The emptying of the refuse body is done by tilting the body after opening the tailgate.

4.4 Operation of lifting devices

Each RCV can be fitted with one of the following lifting device operating systems:

4.4.1 Manual System

The lifting device is manually controlled by a "hold to run" button or lever. Release of button or lever immediately stops the mechanism.

4.4.2 Semi-automatic system

The semi-automatic system requires the activation of the system by the single actuation of a button or lever. The cycle is completed automatically and finishes with the return of the container to the ground.

4.4.3 Automatic system

The automatic system is a system where the introduction of the waste container to the lifting device, starts the action of the lifting and clamping mechanism. The cycle is completed automatically and finishes with the return of the waste container to the ground.

4.5 Loading system

There are the following types of loading system:

4.5.1 Open system with the lifting device situated at or below the rave rail in the position for emptying waste containers and allowing handloading of bulky waste or sacks (see figure A.3)

4.5.2 Closed system with adaption frame and lifting device for emptying waste containers (see figure A.4 and A.7).

4.5.3 Closed system without adaption frame and with guide flap for handloading (see figure A.5).

5 List of hazards and risks

This list of hazards and risks strictly follows EN 414:1992, annex A (see table 1). It considers all risks and hazards which are known in the field of waste collection vehicle's operation. Not mentioned are risks and hazards due to the chassis, public traffic and general misuse. Hazards arising from the type of waste collected or loaded into the RCV, such as toxic or inflammable materials, are not covered in this standard. Risks listed in EN 414:1992, annex A not shown in table 1 do not occur in waste collection vehicles.

NOTE 1 All risks shown in the column "risk" are related to persons standing on the ground or the rear footboards.

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NOTE 2 The term "trapping" includes crushing and/or shearing.

Table 1 — List of hazards and risks

No	Risk	Risk Area	Hazard	Injury	Type	Reference
1	Trapping Hitting					
1.1		Compaction system	Falling into the hopper during operation	Injuries by crushing operatives	Fatal	6.1.2.1
			Operative's hand or arm caught by waste being compacted	Damage to limb or body	Serious to fatal	6.1.2.2 7.1
1.1.1		Static body	Trapping between compaction mechanism and hopper floor or rave rail	Injuries by crushing operatives	Serious to fatal	6.1.2.3, 6.1.2.4, 7.1.1
			Trapping between compaction mechanism and hopper floor during cleaning cycle when tailgate has been raised partially	Damage to hand or arm	Minor to serious	6.2.4
1.1.2		Rotation drum body	Trapping between tailgate structure and rotating mechanism	Damage to limb or body	Minor to serious	6.1.3
			Trapping between body and rollers	Damage to hand or arm	Minor to serious	6.1.3
1.2		Discharge system	Trapping between tailgate and body when tailgate is being lowered	Injuries by hitting or crushing of operative	Serious to fatal	6.2.3
			Cleaning of waste from the vehicle when compaction mechanism is in operation	Damage to limb	Serious	6.2.3, 6.2.4
			Crush or shear trap when access door is open whilst discharging mechanism is moving	Damage to limb	Serious to fatal	6.2.5
			Failure of system that controls raising or lowering tailgate	Damage to limb	Serious to fatal	6.2.1, 6.2.2
			Broken locks or hinges causing unintentional movement of tailgate	Injuries due to hitting of operative	Minor to serious	6.1.1, 7.1, 7.2

(continued)

Table 1 — (continued)

No	Risk	Risk Area	Hazard	Injury	Type	Reference
1.3		Lifting device	Trapping between lifting device or waste container and ground during lowering operation	Injuries by crushing operative's foot	Minor to serious	6.3.6, 6.3.8
			Trapping between lifting device and tailgate	Injury to hand or head	Serious to fatal	6.3.3, 6.3.4, 6.3.8, 6.3.10, 7.1
			Trapping between parts of the lifting device	Injury to hand	Minor to serious	6.3.4
			Trapping between waste container and lifting device	Injuries by catching operative's hand or clothing	Minor to serious	6.3.8, 6.3.11, 7.1
			Impact by moving lifting device or adapted waste container	Injury due to impact or bumping	Minor to serious	6.3.5, 6.3.10, 6.3.12, 6.3.14
			Accidental operation of button or lever	Injury due to hitting by lifting device or waste container	Minor	6.3.7, 6.3.12
1.4		Rear footboards	Vehicle hits solid objects whilst reversing	Injuries by crushing operative on footboard	Serious to fatal	6.6.3
			Rear collision	Injuries by crushing operative on footboard	Serious to fatal	6.8.3.2
2	Ejection of hydraulic fluid under high pressure					
2.1		Lifting device, bodywork	Hitting by high pressure oil jet caused by loose or broken oil hoses	Operative gets oil injection	Serious to fatal	6.4
3	Ejection of waste or waste containers falling off				Serious to fatal	
3.1		Compaction mechanism	Waste ejected from hopper	Injuries by impact of waste	Minor to serious	7.1, 7.1.3

(continued)

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Table 1 — (continued)

No	Risk	Risk Area	Hazard	Injury	Type	Reference
3.2		Lifting device	Waste container not locked safely on the lifting device	Injuries due to waste container falling onto operative	Minor to serious	6.3.1, 6.3.5, 6.3.11, 7.1.5
			Waste container incorrectly positioned on the lifting device	Injuries due to waste container falling onto operative	Minor	6.3.1, 6.3.5, 6.3.8, 7.1.5
			Mechanism not operating correctly due to damage	Injuries due to container falling onto operative	Minor to serious	7.2, 7.2.1
			Hoist cable breaks due to design of winching device	Injuries due to container falling onto operative	Minor to fatal	
4	Falling of operative					
4.1		Footboards	Falling from footboards during reversing of vehicle	Injuries due to falling or overriding by RCV	Serious to fatal	6.6.4
			Falling or slipping from footboards during forward motion of vehicle e.g. on bends	Injuries due to falling or overriding by oncoming traffic	Serious to fatal	6.6.4
5	Noise					
5.1		RCV	Too high sound pressure level	Hearing irreversibly affected	Minor to serious	6.10
			Noise level hinders oral communication and/or hearing of traffic signals	Diverse	Minor to fatal	6.10
6	Explosion					
6.1		Compaction mechanism	Explosion within rotating drum vehicle	Injuries due to impacts by components of RCV e.g. tailgate falling off or lifting device/waste containers thrown away	Serious to fatal	6.12.5
7	Insufficient illumination					
7.1		Loading area	Various hazards e.g. by unsafe handing of load, containers and controls	Various injuries	Minor to serious	6.8.3
8	Maintenance					

(continued)

Table 2 — (finished)

No	Risk	Risk Area	Hazard	Injury	Type	Reference
8.1		Area underneath tailgate	Person hit by tailgate or crushed between body and tailgate	Crushing of limbs or body/injuries due to impacts	Serious to fatal	6.9.1
8.2		Inside body	Crushing or shearing by ejector plate	Injuries to body/ - shearing of limbs	Serious to fatal	6.9.2, 7.2.4
8.3		Inside tailgate	Crushing by components of compaction mechanism, e.g. due to gravity	Crushing of body and limbs	Serious to fatal	6.9.2, 7.2.4
9	Various risks					
9.1	Road traffic accident	Rear of RCV	Impact with vehicle or road	Various injuries	Minor to fatal	6.8.3, 6.12.4.2, 6.12.4.3, 9.2
9.2	Unintended operation of the mechanism	Areas covered previously for risks due to mechanism	<p>Unauthorised modification of controls/control circuit</p> <p>Accidental use of control switches or levers</p> <p>Machine movement unintentionally started or emergency device set out of operation caused by short circuiting due to water ingress</p> <p>Machine movement unintentionally started caused by recovered energy e.g. after unexpected engine stop</p> <p>Unintentional starting or failure on stop functions due to bad design of controls/control circuit</p>	<p>Various injuries</p> <p>Various injuries</p> <p>Various injuries</p> <p>Various injuries</p> <p>Various injuries</p>	<p>Minor to fatal</p> <p>Minor to fatal</p> <p>Minor to serious</p> <p>Minor to serious</p> <p>Minor to fatal</p>	<p>6.8.1.3</p> <p>6.3.7</p> <p>6.8.2.1, 6.8.2.2</p> <p>6.1.2.5, 6.3.14</p> <p>6.7</p>
9.3		Batteries	Short circuit on batteries	Burns	Minor to serious	6.8.4
9.4		Working area around RCV	Tipping over by lack of stability	Various injuries	Serious to fatal	6.11
9.5		Instruction	Insufficient clear instructions for operating maintenance and repair	Various injuries	Minor to serious	6.5, 7.1, 7.2
9.6	Cutting, Toxic, Biological, Fire or Explosion from the waste	Working area around RCV and inside the bodywork	Various	Various injuries	Minor to fatal	6.12.5, 7.1.12